IN THE DRAWINGS:

A Letter to the Official Draftsman is attached with formal drawings for Figures 1-31.

The attached sheets of drawings replace the original sheets of Figures 1-31.

REMARKS

In the Office Action, the drawings were objected to as failing to comply with 37 C.F.R. §1.84(p)(5). The abstract of the disclosure was objected to because it contained claim language and because of informalities. Claims 8 and 39 were objected to because of informalities. Claims 1-14, 16-21, 27, 34, 35, 38 and 39 were rejected under 35 U.S.C. §102(b) as being anticipated by Jacquemet (U.S. Pat. No. 4,799,557). Claims 28-31 were rejected under 35 U.S.C. §103(a) as being unpatentable over Jacquemet. Claims 1-17, 19-21, 27-31 and 34-37 were rejected under 35 U.S.C. §103(a) as being unpatentable over Martin et al. (U.S. Pat. No. 4,844,661) in view of Rice (U.S. Pat. No. 4,390,307). Claims 22-26 were rejected under 35 U.S.C. §103(a) as being unpatentable over Jacquemet in view of Deike (U.S. Pat. No. 4,124,081). Claims 22-26 were also rejected under 35 U.S.C. §103(a) as being unpatentable over Martin et al. in view of Rice as applied to claims 1-17, 19-21 and 27-37 above.

Each section of the Office Action is addressed using corresponding numbers:

1) Not applicable.

2) Not applicable.

3) The drawings have been amended by removing the reference characters listed. See the attached replacement formal drawings.

4) The broad references to the term "means" in claims 22-26 have been removed. Accordingly, these more limited terms may be embodied by at least one item as described in the body of the specification. Please see page 12, lines 1-10 of the PCT specification, which refers to the impact driver being supported on an excavator boom or other arm from a vehicle or excavator. The arm is mentioned as being articulatable/extendable/rotatable.

A new set of replacement formalized figures is attached, including new Figure 31 which shows the impact driver being supported by an excavator boom. Such an excavator boom clearly allows rotational or translative movement of the impact driver relative to the vehicle, as claimed in claims 22-26.

5) Not applicable.

6) The abstract has been amended to not contain claim language.

7) The spelling mistake has been corrected.

8) The claims have been amended to remove all references to "means".

9) Claims 8 and 39 have been amended to more clearly define the invention, and to correct terminology.

10) Claims 32 and 33 have been cancelled.

11) Not applicable.

12) Jacquemet discloses a pile driver which uses an electromagnet to raise a mass to a particular height. Once the mass has been raised to this height, it is released to fall under gravity to impact on a pile.

A distinction should be made between an electromagnet and a Linear Induction Motor (LIM). An electromagnet merely uses electrical power to create a magnetic force to accelerate a magnetic body. A LIM uses creates alternating regions of polarity which travel in a standing wave along the stator. These alternating regions of polarity can be controlled to travel as a standing wave in a particular direction, and at a particular speed. Accordingly, the magnetically responsive reaction member that forms the second part of the LIM which is complementary to the stator can be controlled to move in the same directions, and at the same speeds.

Because the operation of Jacquemet's disclosure is reliant on acceleration due to gravity only (since the electromagnet is only capable of moving the mass in one direction), it would not be operable on all planes (i.e. driving a pile upwardly or horizontally).

The current application teaches the use of a LIM capable of accelerating a mass in both directions, in order to raise it to a particular height (if required) and

also to accelerate the mass downwardly at a greater acceleration than gravity. The LIM is operable on all planes.

It should be noted that the control afforded by the use of a LIM allows the mass to be accelerated not only at a faster rate than gravity, but at a slower rate than gravity as well. This may be useful in particularly delicate situations where, for example, heavier impacts could have an adverse effect on the soil, or could damage surrounding buildings.

Independent claims 1, 38 and 39, have been amended to reflect the fact that the ram may be accelerated and/or decelerated by the LIM in dual directions, and in a controlled fashion.

For these reasons the claims of the present application are not anticipated by US4,799,557.

13) Not applicable.

14) Claims 28-31 are all dependent on claim 1. Applicant believes that the amendments made to claim 1 have rendered the invention novel and inventive, and accordingly all dependent claims are rendered non-obvious.

15) As regards claims 1-17, 19-21, 27-31 and 34-37, Martin discloses a similar invention to that shown in Jacquemet, in that an electromagnet is used to pull the mass upwards, and then to drop it. This invention has even more moving

parts than the Jacquemet invention, and also relies on gravity in order for it to work. The device disclosed in Martin would also not be effective on non-vertical planes.

The device shown in Rice is shows the use of a LIM to drive a pile. However, the pile itself comprises the armature of the LIM, which limits the pile to be composed of magnetically responsive materials such as steel. The pile described in Rice is even further described as having copper sheathing. Clearly this would not be acceptable for the driving of normal wooden or concrete piles.

Further, Rice does not describe the use of the pile driving apparatus to drive piles in non-vertical planes. In fact Rice seems to be focused on the use of the pile driver as part of a continuous drilling or core sampling operation. This would make more sense in this context, since the pile itself may be extended by additional lengths of piles. However, in loose ground, the pile could not be withdrawn to be driven back down to create an impact, since in withdrawing the pile, the hole that was previously made by the pile may be at least partially filled up again by loose matter.

While Rice does show the use of a LIM to drive a pile, the context of its use in seabed operations for core sampling or drilling activities does not lend itself to the idea of pile driving normal timber or concrete piles, or of allowing controlled pile driving thereof at various angles. Further, in the context of its use on the seabed, the factors of size or weight restraints are not a consideration.

The current application teaches multi-plane orientation of the pile driver, which is not taught in either Rice or Martin, and allows a pile to be driven into loose ground as easily as hard ground, because the pile remains embedded in the ground when the ram is retracted. Further, a ferromagnetic pile is not required, and the power imparted into the pile may be carefully controlled by use of the LIM.

Lastly, the height of the current invention may be reduced because the ram is accelerated beyond that normally provided by gravity, and in any direction. Size or weight reduction is not something that is taught in either Rice or Martin.

As regards claims 38 and 39, while Rice describes use of the device as an extraction tool, this seems to be focused on the continuous extraction of a drilling bit or core sampler bit, in the context of underwater drilling. No mention is made of controlled impaction or retraction for extracting the pile. Further, this extraction device would also not be able to extract nonmetallic piles.

This device in general seems to rely on the force created by the LIM to be generally higher than the resistance force of the ground when inserting the pile (or alternatively it must be used in conjunction with a drilling machine which rotates the pile to drill inward), or generally higher than the drag forces on the pile when extracting the pile. If these drag forces are too high, in it unclear how the pile could be moved, except by causing a twisting action to the pile (e.g. by a drilling machine)

to loosen the drag forces. The Rice device does not appear to make use of higher impact energies available by accelerating a mass, but instead seems to be limited to the typical forces allowable by the LIM in driving or extracting a pile.

The current invention, by contrast, not only makes available the higher impact energies for extraction of the pile, but it also allows quick movement of the ram back to its starting position under accurate control of the LIM.

For the above reasons, applicant submits that the current invention is patentable over these.

16) The limitations of Jacquemet are discussed above, in that it is not operable on all planes, and does not allow specific control of the energy imparted to the pile. The use of the Jacquemet system on a base such as that described in Deike would be meaningless, since the Jacquemet system would only be usable in a vertical plane. The only advantage gained form such an installation would be enhanced mobility. Further, the heavy impact weight required by the Jacquemet system would not be suited for mobile operation on a vehicle.

Deike discloses a hydraulic drive system which is usable in various nonvertical planes, but, as taught in the current application, the use of such hydraulic systems is clumsy, heavy, requires a large volume, and is not inherently suited for

mobile operation. Such hydraulic systems invariably include many moving parts, and have an increased likelihood of wear failure.

In contrast, the invention taught in the current application is described as being scalable to the particular application in which it is used. The fact that the current invention uses a smaller weight, which weight may be accelerated faster than gravity would to impart as much energy to a pile than a heavier weight would under gravity, makes the current invention more suited to use on mobile vehicles.

17) Applicant understands the Examiner's objection to be against claims 22-26 on the basis of Martin in view of Deike (as opposed to Martin in view of Rice as stated), since this is what is argued in the paragraph below.

Similar arguments as discussed in section 16 above would apply here, since the use of the Martin system on a base such as that described in Deike would be meaningless. The Martin system would only be usable aligned vertically. The only advantage gained form such an installation would be enhanced mobility by having the system mounted to a vehicle. The articulated arm of the Deike system would provide no additional functionality except maybe fine positioning of the driver.

Further, the heavy impact weight required by the Martin system (since it still utilizes gravity and requires a heavy weight to create high impact energies) would not be suited for mobile operation on a vehicle.

18) Not applicable.

19) Not applicable.

20) Not applicable.

21) Not applicable.

Based on the foregoing amendments and remarks, it is respectfully submitted that the present application should now be in condition for allowance. A Notice of Allowance is in order, and such favorable action and reconsideration are respectfully requested.

However, if after reviewing the above amendments and remarks, the Examiner has any questions or comments, she is cordially invited to contact the undersigned attorneys.

Respectfully submitted,

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Date: May 27, 2008
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